STATE & PRIVATE FORESTRY
R5 FOREST HEALTH PROTECTION
South Sierra Shared Service Area

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To: Jason Kuiken, Forest Supervisor, Stanislaus National Forest
Ray Cablayan, Calaveras District Ranger

From: State, Private, and Tribal Forestry, Forest Health Protection,
South Sierra Shared Service Area

Subject: Assessment of Fire-Injured trees in Arnold-Avery Prescribed Burn,
Calaveras Ranger District, Stanislaus National Forest

Introduction

In mid-July 2023 Calaveras Ranger District implemented prescribed burning on a small unit (12 acres) along FS 5N22 (Township 5 N, Range 15 E, Section 19) that was recently thinned and cleared as part of the Arnold-Avery Project. Fire stayed within the bounds of the fire lines and remained at low intensity based on residual vegetation and bole scorch on trees. A few weeks afterward, nearly all ponderosa and sugar pines in the unit were attacked by bark beetles.

Forest Health Protection (FHP) was requested to assess beetle activity on residual trees in the burn unit, as well as assess other mortality in the general area where thinning treatments are being conducted. On Aug 10, 2023 Beverly Bulaon joined Brady Mcelroy (Forest Service Representative), Carinna Robertson (Resource Management Staff Officer), and Nick Keen-Lombardo (Forest Products Resource Assistant) to the unit and individually examine trees with fresh attacks. FHP returned in September for a follow-up assessment of the unit.

Observations

Mature ponderosa and sugar pines were attacked to varying degrees by red turpentine beetles (*Dendroctonus valens,* RTB) dependent upon the severity of the scorch (see Photo 1). Overall fire effects were predominantly low. Bole scorch appeared to not have burned deeper than the outer bark, and crown scorch was low to minimal on most trees. While scorch did not go high upon boles, a few showed lingering fire at the base which beetles readily attacked. Affected trees had numerous RTB attacks (5-50 per tree) – some as large pitch tubes, others noted by boring dust only. Most RTB beetles did not reach further than 3 feet up from the base, and fewer were outside bole scorch outlines on affected trees. No evidence of other bark beetle activity was noted further up tree boles on ponderosa pines. No woodpecker activity, nor small pitch tubes were noted on ponderosa pines. Only one ponderosa pine suffered a deep burn due to an older fire scar that allowed fire to burn into the heartwood. This pine

Photo 1. Red turpentine beetle activity on Ponderosa pine bole scorch.

will be highly vulnerable to infestation next year as half of the tree is compromised.

Sugar pines were fire-damaged and attacked comparable to ponderosa pines in the unit (see Appendix A). Almost all sugar pines with some degree of bole scorch were infested by RTB. Three sugar pines (trees 5, 10, and 12) were estimated to have crown scorch at 50, 75, and 75% respectively, while most had less than 50% to none. On tree 12, 11, and 9 scorched limbs had broken buds with new growth by August. This was an unusual occurrence: that bud break was later in the season, so estimated crown scorch result was half of pre-bud break. Trees No. 2 and 7 (see Photo 2) had deep undercut burns down to roots that appeared to have killed 1/3 of bole, with numerous RTB attacks around base.

Photo 2. Sugar pine #7 with deep root burns. Note: heavy pitching here not associated with bark beetles, but insect activity and pouch fungus was noted on other sections of bole.

In California, red turpentine beetles begin flight in early spring with peak times continuing through September. Forest treatments occurring during this time are highly attractive to RTB looking for suitable habitat as RTB prefers trees that are injured, stressed, dying, or recently cut stumps (Furniss and Carolin 1992). Even trees with high numbers of RTB or repeated attacks do not often die, but rather other aggressive bark beetles mass attack a larger proportion of the bole resulting in death. According to Region 5 Fire-marking guidelines (Smith and Cluck 2011), red turpentine activity does not confirm trees are killed. Red turpentine beetles attacks alone rarely cause mortality. However, their occurrence may indicate other injuries, or a higher probability of subsequent attack even if trees do not appear affected (Owens et al 2010). The elevated presence of RTB in this burn is an indicator of strong attraction due to fire effects and should be re-evaluated and monitored. Recent thinning activity surrounding this unit may be pulling beetles into the general area, with the prescribed burn concentrating into the unit.

Two large pockets of ponderosa pine mortality within half-mile of the burn were noted. Thirty to 50 trees total were estimated to have been killed back in 2021 and 2022, respectively. The larger group had older kills that may have been centers of attack which then spread to neighboring trees the following years. Only two new 2023 mass attacks at the edge were found. The other group had on average smaller stem diameters and was thinned just recently; mechanical damage was found on a few trees which appeared to have incited attacks. Western pine beetle was the primary agent that killed within these groups, with RTB and woodborers also observed.

Photo 3. Sugar pine #10 with >50% crown scorch.

<u>Follow-up observation, September 25, 2023</u>

FHP returned on September 25, 2023 to assess any additional damage that may have occurred since August. Temperatures had been cooling, no new RTB attacks were noted on trees. Only three sugar pines were confirmed with further insect attacks. Trees 2 and 7 both initially had high bole scorch and deep root burns on one side. Pouch fungus and more pitch streaming was noted on non-burned areas high up tree boles; woodborer galleries underneath removed bark sections confirmed dead cambium in both trees. Tree 10 experienced low bole scorch but up to 50% crown scorch with no additional bud break compared to others (see photo 3). Smaller pitch tubes were seen high up the

bole with multiple pitch streaming – strong indication of bark beetle mass attack. These trees will likely fade by next year based on these indicators. No ponderosa pines were noted with further attacks or damage.

Revisiting this site next spring is recommended as the level of RTB was high, and fire effects linger a few years post treatment. Sugar pines have a lower threshold of crown scorch (55%) for probability of mortality (Pm) of 70 when RTB beetles are present (Smith and Cluck 2011), and larger sizes of conifers tend be more vulnerable. There are cost-effective prevention treatments that can implemented early spring to provide additional protection for high-value sugar pines. Treatments are recommended to stave off subsequent bark beetle attack next summer if coming winter conditions are dry and hinder tree recovery. FHP can provide more information.

If there are further questions or concerns regarding this report, please do not hesitate to contact me.

/s/ Beverly Bulaon
Entomologist
Forest Health Protection
(209) 288-6347 *office*
beverly.bulaon@usda.gov

cc: C. Robertson
B. Mcelroy
N. Keen-Lombardo

References.

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Owen, D. R., S.L. Smith, and S.J. Seybold 2010. Red turpentine Beetle. Forest Insect and Disease Leaflet 55. USDA Forest Service, Pacific Northwest Region, Portland, OR.

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Appendix A. Thirteen sugar pines in the burn unit with damage assessments conducted by Calaveras District personnel.

Tree #	DBH	Bole Insect Impact %	Height of insect damage	Crown Brown %*	Description
1	54.1	0.6	3ft	0	Damage encircles tree thoroughly under 3ft
2	35.4	0.4	3ft	0.25	Concentrated pockets of damage below 3 ft
3	29.3	0.25	2ft	0	Scattered pockets of insect damage
4	52	0.1	2ft	0.25	Isolated pockets of insect damage
5	51	0.35	2ft	0.75	Scattered pockets of insect damage
6	50.4	0.15	1.5ft	0.5	Isolated pockets of insect damage
7	35.7	0.7	15ft	0.25	Damage encircles tree above DBH
8	40.1	0.1	1ft	0.5	Isolated pockets of insect damage
9	40.8	0.05	1ft	0.5	Minor insect damage
10	23.2	0.05	2ft	0.5	One oozing wound
11	54.9	0.6	4ft	0.5	Damage encircles base of tree, line of damage extends up to 40ft
12	30.8	0.05	0.5ft	0.75	Minor insect damage
13	53.7	0.7	5ft	0	Damage encricles tree above DBH